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ABSTRACT

The seven short papers in this collection were developed to support discussions during the 1979 White House Conference on Library and Information Services. The first paper, by Donald P. Ely, discusses information and education in a multimedia world. Other papers discuss technology and information transfer in education (Blanche Woolls); teaching and learning in library information systems (Gerald R. Brong); telecommunications developments and the White House Conference (Frank W. Norwood); technology in education (Frank B. Withrow); information resources available in education (Jenny K. Johnson); and symbol processing in information, communication, and education (Dale W. Brown). (CHV)

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INFORMATION AND EDUCATIONAL TECHNOLOGY

DISCUSSION PAPERS FOR

THE WHITE HOUSE CONFERENCE ON LIBRARY AND INFORMATION SERVICES

NOVEMBER 15 TO 19, 1979
WASHINGTON, DC

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TABLE OF CONTENTS

	PAGE
INFORMATION AND EDUCATION IN A MULTIMEDIA WORLD Donald P. Ely	1
A LAYMAN'S GUIDE TO TECHNOLOGY AND INFORMATION TRANSFER IN EDUCATION Blanche Woolls	5
TEACHING/LEARNING AND LIBRARY INFORMATION SYSTEMS: A FOCUS ON LEARNING Gerald R. Brong	9
TELECOMMUNICATIONS DEVELOPMENTS AND THE WHITE HOUSE CONFERENCE Frank W. Norwood	11
TECHNOLOGY IN EDUCATION Frank B. Withrow	15
INFORMATION FOR LEARNING: THE EDUCATION CONNECTION Jenny K. Johnson	19
SYMBOL PROCESSING IN INFORMATION, COMMUNICATION, AND EDUCATION Dale W. Brown	23

PREFACE

The short papers in this booklet have been developed independently by the seven authors to support the discussions which will take place during the White House Conference on Library and Information Services. The opinions expressed are those of the individuals. They range from strong arguments for change in the way in which the information needs of our citizens are met in the established education systems of the country, to discussions of various technological developments from the communications and information industry.

This booklet is the result of the efforts of the AECT Task Force on the White House Conference on Library and Information Services, under the Chairmanship of Mr. Dale Brown of Alexandria, Virginia. The officers of AECT wish to extend their thanks to the authors who contributed these articles; and they hope that the discussions at the White House Conference will be better as a result of this booklet.

Washington, D.C.
September, 1979

INFORMATION AND EDUCATION IN A MULTIMEDIA WORLD

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Samuel Johnson is reported to have described two types of knowledge: knowing a subject ourselves or knowing where to find information about a subject. Traditionally, education has emphasized the former -- helping students to acquire knowledge. The current information explosion seems to require the other type of knowledge -- providing the learner with the means to locate information.

We live in a time which has been described as the age of information. Marc Porat (1976) points out that information activity accounts for 46 percent of the gross national product (GNP) in the United States. Further, he states that "nearly half the workforce -- some 41,000,000 men and women -- today earn their livelihood by manipulating symbols . . . Information technologies, the wedded twins of computers and communications, are the new catalysts of economic and social evolution. We call this . . . the Information Society."

It should be said today that one indicator of wealth in any nation is its access to information. Thus, an information rich country has greater potential for economic growth than an information poor nation. One key to development in any society is the availability of data and information. A concomitant requisite, however, is the ability to interpret and use the available data and information. From this perspective, information is power.

The information industry is made up of people who handle information. Oettinger (1975) outlines the dimensions of the industry by describing those who work in it and their functions:

The creators -- research and development advertising, computer programmers, authors, composers, poets.

The processors -- data processing services, legal services, bank and credit card services, insurance agents, security brokers.

The collectors -- libraries, data retrieval services, the intelligence community.

The communicators -- education, telephone, telegraph, radio, television, postal services, mobile radio, newspapers, book and periodical publishers, motion pictures, theaters, agricultural extension agents.

The information equipment producers -- computer and related equipment, radio and television sets, paper, photo equipment and supplies.

The focus of this paper is on the collectors and communicators, those people who gather data and information which others have produced and make it available through live and mediated channels to those who need it.

Two Indicators

There are two indicators of the ways in which the users of information services are changing:

1. The increasing use of the mass media, especially television; and

2. The increasing use of nonprint communication technologies by individuals.

When we discuss the user of information services, we are referring to the learner in formal educational settings (elementary, secondary, and post-secondary schools) and in nonformal programs which are not always attached to an educational institution. We are also talking about library patrons who seek out the services of a public library. For our purposes, the term learner will be used to describe the individual who seeks services from a school media center, a college library, or a public library. We will consider the learner to be the focal point of our efforts.

Indicator #1: The Increasing Use of Mass Media, Especially Television

It comes as no news that the average television viewing time in American households is about six hours per day. There is the oft-quoted statistic that by the time youngsters finish high school they have spent more time watching TV than they have in school. Pre-schoolers spend more waking hours watching television than in any other activity. Thus, television has become a permanent fixture in American homes, ubiquitous in its nature and commanding of our time.

The classroom will always come out on the short end if the performance there is compared with the products on the tube. But perhaps we should not enter into such comparisons. Edgar Dale says,

> ". . . entertainment and education are worlds apart . . . The only test of entertainment is immediate pleasure . . . education is memorable, entertainment is written in the sand. The test of entertainment is . . . not in its capacity to furnish our minds with memorable thoughts and deeds but just the opposite." (1967)

We are long on entertainment and short on education. We need entertainment just as we need sleep, but we have far, far too much of it. Entertainment can crowd out the informative, educational aspects of the mass media. Instead of the sauce which adds to the savor, it becomes a whole meal.

The Increasing Use of Nonprint Communication Technologies

Some schools and libraries have adopted the use of nonprint media as legitimate extensions of their charge to serve students and patrons. Teachers and librarians often view audiovisual media as competitors of traditional teaching and learning resources and, in many cases, are completely unfamiliar with even the simplest level of technical knowledge which would permit them to use media themselves or to help learners understand and use these contemporary communication formats.

Technological Developments Do Not Wait For Education

While educators and librarians are pondering what to do with the media that are already here and are so pervasive, more and more technological developments appear as our society is becoming increasingly devoted to the production and distribution of information. The new thrust is derived from breakthroughs in computers, large scale integrated circuits (the silicon "chips"), teleprocessing, the laser, fiber optics, mobile transceivers, satellites, and sophisticated home and office terminals. These are the elements of the emerging information and communication infrastructure. But these technologies are largely unfamiliar, esoteric, and somewhat bewildering to educators and librarians.

Consider a few examples of the new developments. The MCA-Phillips optical disc system already in industrial distribution, is an LP-sized record which provides a half hour of full video color and stereo sound. It costs 60¢ per disc at the factory. Because the data is recorded and read by laser, nothing actually touches the plastic-coated disc, so it virtually never wears out. It can provide freeze frame, slow motion, reverse motion, and automatic search for any one of 54,000 frames per record. For the home market MCA is planning to sell primarily MCA owned movies, which will be very inexpensive. They claim that the five-disc set of "Jaws" will sell for $10 -- almost all of which is profit for MCA.

The computer, too, is becoming highly individualized. In the past fifteen years the logic capability per square inch of the computer has increased seven-fold; another seven-fold increase is expected in the next five years. Tiny chips, which are themselves computers, already have replaced mechanical logic systems in our home appliances, in TVs and microwave ovens. To this will be added the bubble memory, which is the first non-mechanical memory technique which will do to memory banks what the transistor did to logic units. Users will be able to plug a tiny bubble electronic storage unit into their pocket calculators for data storage and retrieval, which means the average school person will have the computer capability in his/her hand that 20 years before required hundreds of thousands of dollars and a roomful of electronic equipment.

These new technological developments are quietly changing the way we work, make decisions, learn, and spend our leisure time. The new products and processes are opening new opportunities and benefits, but at the same time,

new risks are present and policy issues of utmost gravity must be faced and resolved.

By definition we live and work in a technological society. Our schools and libraries are institutions of that society and therefore must keep pace with it or gradually move out of the mainstream into the periphery and suffer additional losses of personnel and resources.

The Road Ahead

Media professionals who are involved in the world of information resources need to coordinate efforts. Combined strength (not competitive struggle) should accelerate and promote the growth of the field. The world is not made up of print and nonprint sectors. It is a world in which people seek information which is responsive to their needs. Regardless of an individual's professional orientation and training, we must recognize the values and limitations of all media formats. We must realize that people use information which is needed, accessible, and easy to use. We must be part of the growing movement to use the resources which technology has given us to deliver information to people who need it, where they need it, and in the form which best matches their communication styles. To do less is to negate the advances we have made as a people.

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A LAYMAN'S GUIDE TO TECHNOLOGY AND INFORMATION TRANSFER IN EDUCATION

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In order for someone outside the education profession to understand technology and information transfer as it affects education, one must first understand the educational setting. Next one must learn about the information to be transferred and the technology available. Finally one must analyze the potential for both.

Public education was inherent in the founding of our country. The powers in government believed that the populace could be better servants of God and better informed citizens if they could read. These same governmental leaders agreed that the authority for this education should exist within the state governments so that the content and curriculum for public education has been and still is under the authority of the legislators in the individual states. In most states this authority is delegated to the local education agencies while in others, textbooks and curriculum have been chosen by state level personnel or committees and provided from a central state office. Public school education is free in all states through high school.

The first genuine public library funds (New Hampshire, 1833) were designated for "common free schools, or to other purposes of education." Thus the public library has always been designed for the continuing education of the "common man." These two agencies, schools and public libraries, combine to serve the educational needs of citizens from birth to death. For some more fortunate citizens, post-secondary education is available, but this is seldom free.

In 1979 several elements exist in common among the states as the attempt is made to continue these educational opportunities for the citizens of the United States.

- Voters are beginning to question all expenditures of tax funds and, whenever possible, to reduce taxes.

- Increasingly states have looked to the federal government to help support the public schools, junior colleges, colleges, universities, and public libraries.

- The unionization of teachers and librarians from kindergarten through college and university as well as the public library staff has presented a force for teacher and librarian rights not in existence twenty years ago.

- The school age population is decreasing in all but a few areas of the nation. The decrease in number of potential students is now reaching the college campus which is already plagued by loss of students

because tuition is high and because potential students are questioning the value of post-secondary education.

- The public has become aware that students who are functionally illiterate are being graduated from high school. The "back to the basics" movement is in vogue at a time when more and more technology is available to support learning.

- The increasing longevity of human life has changed the percentages of citizens in each age group with a higher percentage in the age range of those over age 65.

Alarming statistics are given about the amount of information being generated (e.g., the often quoted fact that scientific knowledge doubles every ten years.) The expansion of technology -- we can copy a book page in Los Angeles and send it by wire to be re-formed in New York, put the text of the Bible on the head of a pin, access a computer for information and have that information returned 1,000 miles from the computer -- permits human beings access to information in quantities. Yet, only selected information is available to everyone.

Information To Be Transferred

Obviously some information is available to the general public in a very popular form of telecommunication -- the television. Nielsen has estimated that by New Year's Day, 1980, there will be 76,700,000 television households (not including Hawaii or Alaska.) This will be 97.8 percent of all families in the 48 states. Information is also available in the 1,753 newspapers in the U.S. which boast a 61,495,000 net page circulation. With 3,075 magazines being published each year, the popularity of two, TV Guide (20,443,254 circulation) and Reader's Digest (18,371,000 circulation), far outdistance number three, National Geographic (circulation 9,756,312), and demonstrate the reading interests of many citizens, As for books, in 1976, there were 39,372 new books or new editions available for purchase.

In a recent survey it was found that three providers of "free" information, school, college and university, and public libraries, had the following quantities of materials at their disposal.

	BOOKS	AUDIOVISUAL	TOTAL
Academic			612,000,000
Public	397,000,000	45,000,000	442,000,000
School	522,000,000	96,000,000	618,000,000

Special libraries are a part of the information industry, but their specialization often limits access to their collections to all but their prescribed clientele. It is also difficult to gather statistics on their holdings.

Technology Available

Federal funds have provided the financial aid needed to build media resources. Indeed the availability of federal funds provided means to purchase all types of media, equipment and materials, for schools, colleges, universities and public libraries. Hardware (equipment) is available to play and/or project software (films, filmstrips, transparencies, microfilms, microfiche, records and tapes, video tapes, and computer tapes.) Waves bounced off satellites in space transmit voices via telephone or pictures and sound via television. Computers can store information in off-line storage facilities, call up the information and generate it in microfiche, microfilm or on paper. Cable television is reaching new and wider audiences. Pay channels offer movies, art, sports, and education. In addition to these broadcast capabilities, an interactive component is available which permits the viewer to respond to the information on the screen and order merchandise or answer the teacher's question or participate in a game show.

The computer has been used to develop self-instruction packages called computer-assisted instruction (CAI). Less expensive teaching machines are also available. Perhaps the most sophisticated combination of equipment has been that in the dial access systems. With these systems, students could dial a program in a carrel (individual study table) and see a film, narrated slides, transparencies, or other visuals, or listen to a recording or a taped lecture following along in a workbook.

Many new developments are less expensive than the dial access system or CAI. The videocassette is in use in schools, public libraries and homes. In the not too distant future many homes and libraries will have the videodisc, a piece of software similar in appearance to the long-play phonograph recording. Now in production for the home audience, a single recording can provide space for 54,000 single pictures or thirty minutes of playing time on one side.

Potential For Technology and Information Transfer

In a climate where the taxpayer prefers a decrease in spending, it is essential that all segments of the education world combine efforts and share information and technology. The potential is there through technological advances. Technology can be used to share collections and services, often saving money. The method is termed "networking."

Networking is defined by the National Commission on Libraries and Information Sicence (NCLIS) as "a formal arrangement whereby materials, information and services provided by a variety of types of libraries and/or other organizations are made available to all potential users." These formal arrangements become difficult when one agency restricts access to a certain age of patron, when agencies are closed for certain periods of the day or week, when the potential user is unaware of the information potential in an agency, when technology and its use is feared by the user, and when owners of information consider their ownership as restricted.

Perhaps one solution to the problems of access is the redefining of the role of each education agency in networking. NCLIS has recently published The Role of the School Library Media Program in Networking (available from the Superintendent of Documents). This document outlines the contributions of school libraries to networks and describes the benefits to the school which belongs to a network.

In many states networks are in existence. School, public, academic, and special libraries have joined together to share collections of materials, cataloging and processing, personnel resources, and other services. In these states, communication exists between the different types of libraries. It is essential that all members of the education community understand each other and that they be understood by the community to be educated. It is also important that all persons be aware of the information available and the technological potential for information transfer. Many persons hold many different types of information which could be shared. The technology for this linkage is available. All that remains is to discover where the information is and convince the humans who control their pieces of information of the need for and methods of sharing.

Unless paper pulp becomes extinct, printing presses shut down, and scholars and scientists, poets and novelists cease their creativity, one can assume that information will continue to be generated. However, information is limited to the persons who have knowledge of the location and storage of that information. Unless fuel supplies dwindle to the point that neither steel nor electricity can be produced, it is reasonable to predict that technology will be available to effect information transfer and that persons desiring information and education will use technology as often as they can when it provides them with the information they need.

Therefore, the White House Conference on Libraries and Information Services delegates cannot merely address the need for information and the potential of technology to provide it, but also must be concerned about the methods which will be needed in order to get agencies and agency personnel to share the information as it applies to the education of the citizens of the United States.

TEACHING/LEARNING AND LIBRARY INFORMATION SYSTEMS: A FOCUS ON LEARNING

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Information and learning are essential in modern society. There is little argument that nearly all, if not all, of human behavior is based on some form of learning -- information is the essential ingredient in that learning.

Generally, learning results any time information is experienced. This learning may result in something observable (like a physical activity or skill or the demonstration of an ability to solve a problem through the integration of information) or in unobservable events (such as changes in attitudes, perception abilities, or ability to process new information).

All of our human activities are based on learning, therefore the essential element to all human activity is information (or the experiences which contain information).

The essential element in the transfer of information and the learning from the experiencing of information, is communication. Communication exists any time there is an interractive transfer of information from place, person to person, or situation to perceiver. As learners experience a situation and obtain information from that situation there is communication occurring.

If we assume that any units storing information are informational units we can define a library as any mechanism that organizes the acquisition, management, retrieval, and display of these resources. A library is an information resource -- and as such it is an essential element in the total teaching/learning-process available in our society.

In considering those involved with the teaching-learning activities, or the management of informational units, we must consider the learner or user of information. Learning, as the result of interaction with information, is a basic event in human activity. In using information we can assume that the learner's objectives are to learn -- that the learner is not really concerned whether the learning is facilitated by a person known as a "teacher" or a "librarian" or whether learning takes place in a facility called a "school" or a "library." Learning will occur whereever and whenever the interaction with information occurs.

Learning is too important to be left only to schools -- free access to information facilitating the operation of our society is too important to be left only to libraries. But, possibly, together programs that support teaching and learning plus the acquisition and management of information collections can meet the demands of modern society.

The goal for library/information-service programs must be to determine the structures and procedures that will optimize--

...abilities to provide access to information for all purposes demanded in our society

...procedures to facilitate learning through the ability to utilize information available from all sources

...strategies to manage information systems ensuring access to information when desired and in a manner appropriate to the person requesting or needing the information.

Through an examination of essential elements in the library/information-service field and the systems supporting teaching-learning activities, it may be possible to see how the future will bring a further integration of the diverse aspects of these two fields.

The fields of educational technology and library science are not the same -- but they are interdependent. This interdependency is obvious as you consider strategies to maximize the effectiveness of information utilization to facilitate learning. Educational technology is concerned with the facilitation of learning through the application of appropriate practices, through the presentation of appropriate informational resources, and through the guiding of appropriate behavior on the part of the learner. Library science is concerned with mechanism of acquiring a wide range of informational units, managing these units so that they can be retrieved and delivered to meet specific informational needs, and the determination of specific informational units to meet both expressed and unexpressed needs of the users of information.

If the core of our information service technologies relate to maximizing learning, the field of educational technology will have a continued, if not increasing, impact on the way in which we manage and provide resources for learning. Educational technology draws upon theories of learning, communication, information science, medicine, and engineering. Results of educational technology can be seen, as specific learning objectives are met, through programs that facilitate the effective use of information.

TELECOMMUNICATIONS DEVELOPMENTS AND THE WHITE HOUSE CONFERENCE

Frank W. Norwood
Executive Director
Joint Council on Educational Telecommunications

The rapid development of new communications technologies raises a tide of complex questions of policy and regulation and the changing communications environment casts implications for the future of libraries and information services which deserve discussion on the agenda of the White House Conference.

For example, the impact of computer technology is already felt in the form of library automation and the growth of such bibliographic networks as OCLC (formerly the Ohio College Library Center). The emergence of digital networks for computer communications adds the prospect of almost universal access to computer-stored bibliographic and even textual information. Some have called for the development of a "national library network" which could make available to every institution -- perhaps to every citizen -- the machine-readable resources of every major library. But how should such a network be organized and funded? If left to the private sector, what guarantees will we have of universal access at reasonable cost? If such a network were to be a Federal responsibility, where would the dollars come from in this era of Proposition 13 and zero-base budgeting? What are the dangers of centralizing the decision-making powers which govern such an information resource in the hands of any bureaucracy, public or private?

In the field of common carrier communications, policy decisions made within the past decade have opened the field to new networks, specifically designed to handle digital computer traffic, but the field continues in a state of flux. In the Congress, Van Deerlin's proposed "top-to-bottom" rewrite of the Communications Act of 1934 has proved a vain hope, but less thorough-going revisions may still be anticipated from the House. The two Senate proposals focus on revising the unique roles of AT&T in domestic communications and the Communications Satellite Corporation in international communications. What implications such changes will have for the further development of library and information communications will require careful consideration.

Among the emerging technologies, the marriage of the television screen and the printed work via "videotext" and "teletext" can hardly be ignored by those interested in library and information services. Even the terminology by which they are described is still not universally agreed upon, but both videodata and teletext open the prospect of making of the home TV set a display device for written information and simple graphs and charts, called up and selected at the command of the user. There are a variety of systems with such propriatary names as "Prestel" (the British Post Office), "Ceefax" (the BBC), "Oracle" (British commercial television), the French "Antiope" and the Canadian "Telidon."

Some 20,000 TV sets in Great Britain are currently equipped to receive BBC's Ceefax and the Independent Broadcasting Authority's Oracle. With such sets, viewers can chose and display several hundred "pages" of news, sports and financial information which are transmitted in the "blanking lines" which separate each broadcast TV frame from the next, in a manner similar to the way in which PBS transmits "closed captions" for the hearing-impaired. While the needed converter is expensive -- $400-$600 -- access to the information is free because it is broadcast over the air.

The British Post Office (BPO), has developed a somewhat more sophisticated system in which the information is carried over the telephone system, which in Britain is operated by the BPO. Because the user is wired into the system, some forms of interactivity are possible, including record-keeping with regard to the user's use of the system. Thus, BPO can and does charge users per inquiry, typically 1/2 pence per page, but BPO also sells pages on the system to "information providers" at a flat rate of $8,800 plus $8.80 per page used. Thus some pages can be accessed free ("brought to you by the makers of ...") while others carry a premium price.

Both systems are now being tested on an experimental basis in the United States as are variations developed in other countries. Before any "videotext" (systems which use phone lines) or "teletext" (over the air) are authorized on a permanent basis the Federal Communications Commission and perhaps other policy making agencies will have to set the parameters under which these new information services will operate. What will all this mean for traditional libraries, long a principle source of information for the consumer? Are videotext and teletext new means for expanding the reach and service of the public library or a threat? Are these the shadows on the wall which forecast the direct interface of home users and emerging library networks, bypassing as obsolete the traditional institutions? No one can say for sure, but a conference which fails to consider such issues will have overlooked the presently existing developments which are likely to make profound changes in our future.

In the international arena, the Third World is making increasing demands for more nearly equal access to information and communications. Many of these problems will surely be discussed at the conference's international information exchange meetings, but there are important related telecommunications issues as well.

The 1979 General World Administrative Radio Conference will meet from September 24 through November 30 in Geneva. While the International Telecommunications Union (a UN agency whose roots go back one hundred years) convenes WARCs almost every year on specific communications topics, such a General WARC, with an agenda which covers all of the electronic communications spectrum, comes only about once in twenty years.

The matters before the GWARC will be many and complex, but the highly technical considerations which go into arriving at consensus about what radio frequencies are to be allocated to what services cannot be allowed to obscure the fact that "merely technical" questions often have answers which shape public policy as surely -- and perhaps more so -- than debates in the UN General

Assembly and UNESCO. The White House Conference does not need to consider the whole agenda of the Geneva meeting, but participants should be aware of its work and that its decisions will likely have direct impact on the future development of domestic satellites -- including satellites for direct broadcasting -- and upon international shortwave broadcasting which continues to be a major vehicle for the international flow of news and information.

Spokesmen for the developing countries have called their desired "New World Information Order" a counterpart of the "New World Economic Order" which they also demand. The fact that information and economic concerns have equal priority and that a revolution -- a peaceful revolution, we may hope -- is called for indicates the importance of these issues to the White House Conference.

TECHNOLOGY IN EDUCATION

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There is every reason to expect that technology will continue to develop at a rapid rate in the information transfer area. The power of the computer is expected to increase in scope and at the same time cost less. Licklider believes that computer hardware will double in cost-effectiveness every two years during the decade of the 80's. Already, we are talking about the next generation of videodiscs, even without the current generation being available in the open market place. The excitement about this next generation of videodiscs is that it will use digital storage. This means that vastly larger numbers of bits of information can be stored and recalled by the learner on a single disc. The disc now can store and recall single frame and full color motion pictures and provide audio in two languages as required by the learner.

The decade of the 80's can be the learner's decade if we are futuristic enough in our design packages. Most media in today's market has been designed in a traditional sequential manner. This has been based upon print and/or serial formats which have been more a restriction of the medium than of the mind. Socrates in his exposition on teaching allowed the student to question and to pursue simultaneous interests and to logically relate them to the whole. The ideal learning experience has long been characterized as a student at one end of the log and a master teacher at the other. This implies a random source of information instantaneously available to the learner to be used as determined by the learner. The coming of print and the writing of experiences onto permanent materials caused us to shift our patterns of learning and instruction. We no longer were students sitting at the feet of a master teacher free to explore all manner of knowledge. We began to organize and put onto paper our thoughts which no longer required the master to be present. The structure of learning became one of instruction; one that did not require the master teacher, that was ordered in Aristotelean logic, that classified and put each thing in its place. This system of thought and learning has allowed us to bring about an age of science to study and to grow; but, it is not the most effective means of learning within a modern high information society.

We have come full circle so that through technology it is possible to store and retrieve a wide range of information and experience at the will of the learner. We can again capitalize on the creative curiosity of the learner. We can provide both structure and random exploration as we exist with the true tutorial example.

The technology of the intelligent or computer controlled videodiscs allows us the freedom to design learning materials that can give the learner vicarious experiences which are under the control of the user. A single disc and

computer assisted instructional program can provide a learner controlled sequence of events. Take a simple mystery story. It can be designed and programmed so that a multiple number of stories are on a single disc. The learner in conjunction with a computer program can make decision points in the story which allows the learner to make his or her own personal story. The Lister Hill library is authoring complex medical techniques that can be used for multiple purposes. A complex heart operation can be used by the patient to inform him or her of the nature of the operation, another sequence for the senior surgeon can describe very complex operating techniques. The learner is the determiner of what he or she will experience.

Such technology requires a new breed of learning designers; ones that have an ability to blend the needs of education to the creative and performing talents of the stage and to combine them with information science. Such designers must think simultaneously rather than in the tradition sequential design of curricula specialist. It is the ability to see the interlocking structures of the learning experiences that is important. We don't have many developers that currently think in formats that warrant such use of the new technologies.

There will be in the 80's people who use the new technologies only to provide new skins for their old materials. This will be disasterous as far as cost effectiveness is concerned; because the new technology will be efficient only as we begin to use its full power.

There are a number of forces within the educational community that will put pressure upon us to use technology as a learning resource. The demand for more accountability, and for education that is appropriate to a child's needs will only be accomplished through wise and effective uses of technology. We cannot survive as a modern society with the basics of yesterday's nostalgia of the little red school house. Nor can we continue to think of the teacher as an isolated entity imparting knowledge to students. Today's society demands greater learning resources than ever before. We as a society must educate all of our children from the gifted to the slowest with an equal educational opportunity regardless of where the child lives. These demands for accountability and for equal access to quality education will force more use of technology. Already, the modern child spends more time in front of a television set than in a classroom, and is exposed to a wide range of computer interfaces from home video games to home computers.

The telephone can hook up anyone to any information source any place in the world. All of these factors demand that educators use learning resource centers which guide both the learner and the teacher towards learning experiences that meet the needs of each child according to his or her ability. Computer Based Education such as that instituted by CDC PLATO are just a scratch on the surface of the potential. Today we have decreased the cost of technology so that it is feasible for use within the classroom. By 1984 the National Science Foundation anticipates that there will be 600,000 microcomputers in use in public schools. While the home sales of computers has not been as rapid as the most optimistic were predicting a few years ago they are still selling at a healthy pace. The sophistication of the computer game is rapidly encroaching upon the educational market place.

Educators have a responsibility to take advantage of the new resources and to impact upon the design of educational technology and the development of new and cost effective uses of information resources.

A few years ago Patrick Suppes noted that public schools might be a passing technology who's time had passed. He meant by this that in the long history of man the concept of learning within a school is relatively short. For the most part learning took place as an apprentice to a master or through imitation of older members of a family or tribe. The school was a convenient place to bring together those young people who were not yet members of the work force to teach them some of the basic economic and social skills required by an industrial society. In an electronic communication society the containment of learning to a school environment is neither essential nor necessary.

Perhaps the decade of the 80's will see the school become a true learning resource center which counsels and manages educational experiences for all members of a community. The school will be a central or focal point from which learning experiences will be managed.

These dreams will come about, either with the support of the educator or in spite of the barriers established by educators. The challenge is for educators to welcome these changes and use new technology to shape the learning experiences of their charges. We must do it, because to leave the educator out of the electronic age will limit the uses of information technology and significantly decrease the promise of a good life for all.

> "Since our society is so profoundly influenced by science and technology, which the bulk of our citizens understand poorly or not at all, the widespread use of inexpensive computer facilities could just possibly play an important role in the continuance of our civilization."
>
> Carl Sagen

INFORMATION FOR LEARNING: THE EDUCATION CONNECTION

Jenny K. Johnson, Ph.D.

The designation of "life long learning" as one of the five themes for the White House Conference on Libraries and Information Services calls attention to the information resources for education across the country. What information resources are available; are there connections?

There is no national education library as there is serving medicine, agriculture and other fields; and it is NOT the intention here to propose one. The Department of Health, Education and Welfare (HEW) Library was to be closed as of August 1979, but according to Charles Gately, Library Director, the closing has been postponed indefinitely pending further study by Secretary Harris. There are some 18 libraries under HEW auspices one of which is the Educational Reference Center, the Educational Resources Division of the National Institute of Education (NIE) located in Northwest Washington, D.C. This Educational Reference Center is responsible for providing research and retrieval services in education related literature and resources, and handles some 8951 inquiries over a six month period according to Judy McDowell, Reference Librarian. The majority of these inquiries are from the Office of Education, National Institute of Education and other educators. The Center has access to over 29 computerized data bases[1] including ERIC, the Educational Resources Information Center network which has headquarters at NIE. ERIC is the resource for research reports in education which are collected and cataloged at 16 different clearinghouses across the country.[2] In addition to other services, according to Robert Chesley, Director of ERIC, information analysis products are created by the clearinghouses on significant education issues and are available on inexpensive microfiche as well as print. There are eight regional education laboratories supported chiefly by NIE which create and disseminate information for educational activities. The Office of Education has an Educational Materials Center (EDMARC) in the Information and Materials Branch which serves as a national book evaluation, examination and review center for teachers, librarians and the general public.[3] EDMARC and the current materials display is at the Office of Education in Southwest Washington, D.C., but the bulk of the collection, which until recently was housed at the former Federal City College, has been placed in storage and is not available to anyone. In 1978 the Information and Materials Branch received 51,018 telephone inquiries and a similar number in 1977 according to Myra Thomas, Branch Chief. These inquiries were answered without ready access to any of the computerized data bases.

There are some 450 different "technical assistance centers" providing education information, materials and services to the field supported by the Office of Education and the National Institute of Education.[4] These Centers include the 42 Bilingual Education Centers; 34 Civil Rights Assistance Centers; 21 Follow-Through Resource Centers; 93 Handicapped Centers including 26 Direction Service Centers. A National Diffusion Network has 53 State Facilitators and eight Technical Assistance Base Service Units. There are 13 Research and

Development Exchanges and 10 Office of Education Regional Offices. There are 73 Teacher Centers including resource exchanges and some 61 projects. There is also the Teacher Corps with 16 networks and four Recruitment and Community Technical Resource Centers. There are 11 Title I Evaluation Centers and 64 Vocational Education Centers. Each of these "technical assistance centers" is a functioning active program and does not overlap with another. The education agencies of each state also have information services for various learning activities as well as the universities and colleges and the professional associations.

This decentralization places information and materials resources close to those who need to use them, but tends to fragment information and limit the user to those particular resources at hand. Each center and agency must try to keep up with developments across the field since there is no comprehensive file on field programs and related activities which provides descriptions, abstracts and cross references. A year ago one of the Office of Education Regional Offices proposed a recommendation for a data bank of such information and other activities be created by the U.S. Office of Education Information and Materials Branch.[5] However it was not acted upon.

With the present technology for the transporting and managing of information it is not only practical but essential to use centralized information sorting to serve decentralized activities. A phone call to a colleague, the most frequently used method of seeking information, is not enough. The accessibility of information is the single most important factor to its utilization. For example, cutting energy costs is a new concern for school personnel across the country. The American Association of School Administrators now has a staff expert on energy. The Tenneco, Inc. oil company has just completed an energy assessment of public schools nationwide. The National Energy Act, passed last fall, offers help for schools. The U.S. Office of Education has information on school bus travel and a private consultant is working on efficiency factors for bus routes. And there is more information being created daily on this subject and others like it. Coordinated reporting and thorough searching is necessary to acquire and update such information. These library functions and information services are developed in other fields, why not in education?

Those working on learning activities, whether community services, industry training, formal schooling or technical assistance; whether local, district, state, or regional should be able to contact an up-to-date data bank. There is much information for learning, but few connections for the user.

References

[1]"Educational Resource Division" a brochure of the National Institute of Education. Retrieval Services (Direct Access Files) include:

Educational Resources Information Center
Exceptional Child Education Abstracts
Abstracts of Instructional and Research Materials
Social Sciences Citations Index
Psychological Abstracts
National Technical Information Service
Foundation Grant Index
Congressional Information Service
American Statistical Index
Library of Congress
Smithsonian Science Information Exchange
Dissertations Index
National Library of Medicine
National Institute of Mental Health

[2]ERIC Clearinghouses include:

Adult, Career, and Vocational Education (Ohio State Univ)
Counseling and Personnel Services (Univ of Michigan)
Early Childhood Education (Univ of Illinois)
Educational Management (Univ of Oregon)
Handicapped and Gifted Children (Council for Exceptional Children)
Higher Education (George Washington Univ)
Information Resources (Syracuse Univ)
Junior Colleges (Univ of California)
Languages and Linguistics (Center for Applied Linguistics)
Reading and Communication Skills (National Council of Teachers of English)
Rural Education and Small Schools (New Mexico State Univ)
Science, Mathematics and Environmental Education (Ohio State Univ)
Social Studies/Social Science Education (Boulder, Colorado)
Teacher Education (American Assoc of Colleges for Teacher Education)
Tests, Measurement and Evaluation (Educational Testing Service)
Urban Education (Teachers College, Columbia Univ)

[3]"Education Briefing Paper", Educational Materials Review Center, October 1977, U.S. Department of Health, Education, and Welfare/Education Division.

[4]"National Program Profile" draft, August 10, 1979. Editor Harold Haswell, U.S. Office of Education Regional Office, Dallas, Texas.

[5]"Memorandum" Subject: Proposed Expansion of the U.S. Office of Education Information and Materials Center. August 7, 1978, from Robert Radford, Director, Division of Dissemination, USOE Regional Office, Seattle, Washington.

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SYMBOL PROCESSING IN INFORMATION, COMMUNICATION, AND EDUCATION

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Our environment is dominated by symbols which are designed to communicate information, affect behavior, or stimulate change. While not a new phenomenon, this is an increasingly complex one. We must function in a society saturated with information-bearing symbols transmitted by advanced technologies on a global basis.

In spite of our electronic media, universal educational opportunity, highly developed skills, and sophisticated communication potential, we have not achieved a totally literate society able to communicate effectively.

American Express Company Chairman, James D. Robinson III, has warned that in an era of "information overload" and dwindling time or patience by the public to absorb it all, the United States is "becoming a nation of fast-fact junkies. Despite the massive amounts of information now available to us, our society seems unable to understand the complex issues facing it, unable to sort out viable alternatives, and unable to establish common goals." Robinson argued that for the American system to work, "there must be an informed public which has the facts presented in ways that it can digest."

Instead, he continued "...dramatic confrontation is highlighted while thoughtful analysis is often played down...the public is demanding that messages be compressed into neat, small packages...people in business, government, and politics are learning to master the art of the buzz-word and the short descriptive phrase...they've learned that's the best way to capture the headlines." The result is a communication breakdown, a perpetual monologue. (The Washington Post, June 14, 1979)

How could we have reached such an impasse as the twentieth century moves toward a close? Is this purely political rhetoric, or is there some imminent danger that we will indeed be overwhelmed by an information avalanche which we are unable to decipher, interpret, and utilize to perpetuate and extend a society of intellectual integrity and strength?

From the very beginning of the human family, we have been symbol creators and processors; attempting to record our acts and deeds for posterity while simultaneously developing a means of communicating amongst ourselves. The great cave paintings reflect this early effort, which in time was refined into pictographics. Cuneiform writing on clay tablets followed; hieroglyphics, mathematical symbols, and alphabets were created. Languages proliferated; literature developed. Data were collected and recorded. With the advent of Gutenberg's moveable type around 1456, a new era in human history began. Information could now be widely disseminated; the bases of culture were

broadened; and the common man achieved increased options in a more fluid society. It would be a society dominated for several centuries by a "linear" culture, as defined by Marshall McCluhan.

Subsequent events have brought us to the present technologically dominated society with its electronic media and information delivery systems. New data have been generated, and proliferate in exponential proportions (doubling every five years by some recent estimates) bringing us to the information age where we are bombarded with more symbols than we can process, more information than we can assimilate, more stimuli than we can absorb.

What is to become of us in such an environment; will the human family not only "endure but prevail" as Faulkner views our destiny, or will we merely end "not with a bang but a whimper" in T.S. Eliot's words?

Part of the answer must reside in our ability to reshape the educational process in relation to the information deluge. The process must respond to the need for a more effective interface between technology, information, and society.

The technological society within which learners will function in the 1980's and beyond will differ vastly from anything we have known previously in western civilization. It is a society in which technology will penetrate every phase of human activity, changing and transforming the culture in radically new and significant ways.

This societal revolution will be generated by the expansion of computer technology and parallel telecommunications development. The rate of growth has already been phenomenal. "There were some 1,000 computers in America in the early 1950's, and no microcomputers (or microprocessors, or computers-on-a-chip.) By 1976 there were 222,000 computers and three quarters of a million micros. By 1980 Americans are expected to be operating 10 million microprocessors." (Saturday Review, June 1979).

In addition to the expansion of cable and satellite transmission, with the advent of microcomputerization, digitalized television may also become a dominant delivery system. Two major systems are already on the horizon, "teletext" and "viewdata." With additional hardware and computer linkage the home television screen is already being projected as a "home video information center." (Newsweek, July 30, 1979).

American Education of May, 1979 carries the story of another type of computerized communication.

> "At three o'clock in the morning, an elderly lady, unable to sleep, rolls her wheelchair down the nursing home corridor to a room with a computer-connected typewriter. She types her special code name on the typewriter. Immediately a message flashes onto a terminal display screen: "Dear Grandma..."
>
> The message stored in the computer is from a young friend she has never seen, but with whom she has been trading messages. Her

correspondent is a cerebral palsied child who earlier in the day had laboriously typed out an incident he wanted to share. After reading his story, the woman edges her chair closer to the typewriter, types in the boy's code name, and begins, "Dear Joey..." She types out her memories of a similar incident that happened to her when she was about his age. In the morning, Joey will plug into Grandma's code and read her story."

This is not some mythical story of the future, but is rather a current event.

The video-disc is likewise opening new vistas in terms of educational application and utilization in information delivery systems. Now on the "cutting edge" of development applications, its impact is yet to be assessed.

What do such developments mean in terms of human behavior and societal concerns? Will we in response to some futuristic product become a nation of contemporary cave-dwellers, emerging from our electronic ghettos for some minimal social interaction? What will happen to our sense of community if we begin to do our banking, worshipping, shopping, information retrieval, and learning in the privacy of our own homes utilizing interactive electronic technology? These are questions which the social scientists and futurists are currently pondering.

The goals of education include a responsibility far larger than transmitting information and disseminating data. Any responsible educational institution in our society will also take into consideration the necessity for using information to achieve moral objectives. The imperative for making value judgments in an enlightened context is a part of the total educational process. The question: Information for What? must be raised in a society professing a commitment to moral and spiritual values. A fundamental responsibility of educational, as well as religious and other value oriented institutions, is to question the role of information generation, collection, retrieval, and dissemination in contributing to the improvement of the individual and to the betterment of society. Information alone will not do. It must beget knowledge, which on occasion is transformed into wisdom, if we are to survive and escape the fate described by Housman:

"I, a stranger and afraid
In a world I never made."

Education must provide a structure for learners to find their way through the electronic maze of multiple information delivery systems. The individual is born into a symbol dominated culture. The ability to understand those symbols, select the ones that are important, and relate them to daily living is critical to functioning effectively in modern society. The learner must become a competent symbol processor: the recognition, encoding, decoding, manipulation, and restructuring of data in multiple formats is basic to his survival.

Many could agree that a goal of education is to transmit the accumulated symbols of the culture in order to perpetuate a literate society. Another goal of education is to develop communication skills for each learner to use

in the information dependent community of the present and future. The catch phrase "back to the basics" appears frequently in the current mass media. Today the skills needed to live in our technological society are significantly different from the basic survival skills of the nineteenth century agrarian community. The majority of jobs are tasks within larger more complex activities; the specific end product or service the worker never sees. This interdependence and specialization of tasks places different requirements on the curricular activities needed to develop appropriate skills. But within our society the ability to manipulate symbols has been, and continues to be, a basic skill required in the educational process. If today's learners are to be equipped to meet the needs of the society which they will shortly encounter in the twenty-first century, then our efforts must continue to be directed toward a comprehensive literacy which includes effective symbol processing by the individual.